

1 CLAIMS

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3 1. Apparatus for the stimulation of molecular
4 resonance by the application of very low intensity
5 electromagnetic radiation, comprising a laser of
6 multiple line cavity resonance consisting of a laser
7 diode with a collimated or near collimated beam, said
8 beam being passed through a phase cancellation
9 optical element having the characteristic of
10 cancelling several of the central lines of the laser
11 frequency while leaving the higher and lower
12 frequencies generally uncanceled such that the beat
13 frequency of the passed frequencies forms a pattern
14 of interference of constructive and destructive nodes
15 in which the diameter of the beam is set to be a
16 sufficiently low multiple of the wavelength of the
17 beat frequency to allow a substantial Fresnel zone to
18 be apparent in the beam and in which an aperture is
19 provided to select a portion of the Fresnel zone
20 wherein a substantial majority of destructive nodes
21 are apparent relative to the constructive nodes and
22 in which means are provided to modulate the laser
23 frequency.

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25 2. Apparatus as claimed in Claim 1, wherein the
26 laser frequency is varied by adjusting the current on
27 a laser diode.

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- 1 3. Apparatus as claimed in Claim 1 or Claim 2
2 wherein the laser frequency is varied by physical
3 alteration of a secondary cavity such as a crystal
4 provided to double the primary frequency.
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- 6 4. Apparatus as claimed in any of the preceding
7 Claims wherein the modulation frequency is a harmonic
8 of the beat frequency.
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- 10 5. Apparatus as claimed in any of the preceding
11 Claims wherein the modulation frequency is a harmonic
12 of a specific molecular resonance.
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- 14 6. Apparatus as claimed in any of the preceding
15 Claims wherein the aperture or angle of the beam
16 passage through the cancellation device may be varied
17 consequently varying the beat frequency.
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- 19 7. Apparatus as claimed in any of the preceding
20 Claims wherein the selected portion of the beam may
21 be varied to alter the balance between constructive
22 and destructive nodes.
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- 24 8. Apparatus as claimed in any of the preceding
25 Claims wherein the means for modulating the laser
26 frequency is the consequential mode transition of a
27 laser diode in pulse mode.

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2 9. Apparatus as claimed in Claim 8 where the laser
3 diode mode is held within bounds by reflection from a
4 Bragg grating so that the modulation of the Fresnel
5 zone nodes is a consequence of the Fourier transform
6 of the pulse.

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8 10. A method of stimulation of molecular resonance
9 by the application of very low intensity
10 electromagnetic radiation modulated at resonant
11 frequencies of molecules of high Q by use of a laser
12 of multiple line cavity resonance consisting of a
13 laser diode with a collimated or near collimated
14 beam, said beam being passed through a phase
15 cancellation optical element said cancellation device
16 having the characteristic of cancelling several of
17 the central lines of the laser frequency while
18 leaving the higher and lower frequencies generally .
19 uncanceled such that the beat frequency of the
20 passed frequencies forms a pattern of interference of
21 constructive and destructive nodes, in which method
22 the diameter of the beam is set to be a sufficiently
23 low multiple of the wavelength of the beat frequency
24 to allow a substantial Fresnel zone to be apparent in
25 the beam and in which an aperture is provided to
26 select a portion of the Fresnel zone wherein a
27 substantial majority of destructive nodes are
28 apparent relative to the constructive nodes and in
29 which means are provided to modulate the laser
30 frequency.

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2 11. Apparatus for the production of sub picosecond
3 light pulses, the apparatus comprising a laser
4 producing a collimated or near collimated beam, a
5 phase cancellation optical element through which said
6 beam is passed, said phase cancellation optical
7 element being formed by the series combination of a
8 first diffraction grating, a refractive element and a
9 second diffraction grating, whereby a pattern of
10 interference of constructive and destructive nodes is
11 formed in which the diameter of the beam is set to be
12 a sufficiently low multiple of the wavelength of the
13 beat frequency to allow a substantial Fresnel zone to
14 be apparent in the beam, the apparatus further
15 including means for pulsing the laser with short
16 duration pulses to produce for each pulse an isolated
17 traverse through the frequency mode of the laser.

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